(12) UK Patent Application (19) GB (11) 2 058 819 A

(21) Application No **8028902**
(22) Date of filing **8 Sep 1980**
(30) Priority data
(31) **75667**
(32) **14 Sep 1979**
(33) **United States of America (US)**
(43) Application published **15 Apr 1981**
(51) **INT CL³ C09K 3/30**
(52) Domestic classification **C4X** 11
(56) Documents cited **None**
(58) Field of search **C4X**
(71) Applicant **Charles Edward Johnson, 0680 White Cloud Drive, Breckenridge, Colorado 80424, United States of America**
(72) Inventor **Charles Edward Johnson**
(74) Agents **Alan Tromans & Co., 7, Seymour Road, Finchley, London N3 2NG**

(54) Emulsion composition for controlling allergens

(57) A composition and method for controlling house dust allergens involves the periodic coating of various host substrates such as fabrics with a pressurized stable emulsion coating composition comprising water, an organic hydrophobic control agent having a flash point between 167° and 260°C that preferentially wets, bonds and/or reacts with various allergens present in house dust, an emulsifier, and a propellant.

GB 2 058 819A

SPECIFICATION

Emulsion composition for controlling allergens

Dust in the home or "house dust" is the source of troublesome symptoms of allergy for an unknown number of people who may be constantly bothered by sneezing and a runny nose or by wheezing and shortness of breath. The possible harmful effects of house dust have been recognized for some time. More recently, the dust fauna, in particular anthropods such as pyroglyphid mites and their debris, received attention in relation to house dust atopy, an important factor in the etiology of bronchial asthma and rhinitis. The symptoms that result from allergy to house dust are usually those of perennial allergy rhinitis, sneezing, runny noze or nasal obstruction, and watery itching eyes. These may be identical to symptoms associated with seasonal hay fever.

Current literature surveys indicate that no recommendations can be given for control of house dust mites. Neither chemical nor sanitary controls are deemed possible due to the lack of knowledge in this field. Moreover, it has been established that most acaracides had little effect at concentrations under one percent which in most instances is too severe a treatment to be used in the household on known areas of high mite density such as bedding, upholstery, etc., where humans are constantly exposed. Moreover, these treatments did not control mite debris, a known allergen.

Therefore, an object of the present invention is to control the allergens found in house dust.

Another objective of the invention is to provide a composition for controlling allergens found in fabrics, and this composition is suitable for use around humans.

A further object of the invention is to control the debris of pyroglyphids found in fabrics.

Still another object of the invention is to treat fabrics to restrict the mobility of mites, and mite debris, maintain a low moisture environment around mites, and isolate mites from critical nutrients.

Still another object of the invention is to apply a composition for controlling allergens found in fabrics by a means that provides control of the rate of application and the uniformity of said application, such that the fabric can be completely coated yet will dry within a reasonable period of time.

These and other objects of the invention will be apparent from the following description and claims.

The link between pyroglyphid mites, allergy and house dust now suggests that allergy relief can be obtained in a typical household environment by altering the microenvironment of these mites in those specific areas of the household which would have the most significant effect on controlling mite activity. Moreover, such an alteration of the mite's microenvironment can be achieved in a manner which is compatible with exposure to humans.

It has been established that certain areas of a typical household which are characterized by a predominance of fabric being present, such as upholstered furniture, bedding, mattresses and carpeting, provide ideal host environments for pyroglyphid mites. It has now been found that if these fabrics are periodically treated with a composition having certain physical and chemical properties, that the pyroglyphid mite activity on and in those fabrics can be controlled with a corresponding reduction in the allergy potential of those fabrics. It also has been found that the form of the composition is important to the control of pyroglyphid mites and, specifically, control of the rate of application, uniformity of the application and drying time. To this end it has further been found that an aerosol spray of specific compositional constituents is effective in reducing the activity of pyroglyphid mites and in controlling mite debris.

Controlling mite activity includes controlling the biological as well as physical activity of the mite and its debris, which includes its chitinous exoskeleton and excrement.

It has been found that controlling the activity of mites can best be achieved by altering the microenvironment of certain fabrics traditionally high in mite density with a coating composition which tends to isolate the mites and/or their exoskeleton and excrement. It has also been found that this type of control reduces allergic responses significantly. In addition, if an appropriate substance is selected to isolate mites and their debris, certain other critical environmental factors such as moisture level and nutrient availability can also be altered, which will further control the activity of the mite.

Mite nutrients include human scale, dander, dust fibers, food particles. The isolation of mites from these critical nutrients is achieved by coating certain fabrics found in a household where mites tend to live and reproduce. This coating forms a barrier on the fabric between the mites present and fugitive nutrients which tend to collect on these fabrics after treatment.

Thus, optimum substances for controlling mite activity include coating compositions which—

(a) restrict the mobility of mites and mite debris,

(b) maintain a reduced moisture environment around the mite, and

(c) isolate and/or encumber the mite from critical nutrients, but

(d) should not alter the hand or feel of the host substrate, and

(e) should disrupt the normal use of the host substrate for a nominally minimum period of time.

It can be appreciated that the host environments for the mite are typically fabric surfaces found around the household. As such, treatment of these surfaces is the most effective means for controlling mite activity.

The compositions of the invention suitable for controlling allergens in fabrics comprise an oil-and-

water emulsion coating containing—

(a) a hydrophilic solvent having a flash point between 350 and 500°F.,

(b) an emulsifier,

(c) a propellant, and

(d) water.

The coating obtained from these pressurized compositions is hydrophobic, substantially continuous, and restricts mite and mite debris movement while altering the microenvironment of the mite by forming a barrier to nutrients and water.

Repetitive applications of these coatings to certain fabrics in a household have been found to substantially reduce the activity of pyroglyphid mites and their debris with a corresponding reduction in the allergy potential of these fabrics.

RESTRICTION OF MITE AND MITE DEBRIS MOBILITY

The coating compositions of the invention are only effective as long as the dust mite and its debris are immobilized and the mite is maintained under less than optimum growth conditions. For examples, it is critical to the present invention that the coating applied to various fabrics be hydrophobic. That is, the coating itself should not attract moisture that could possibly aid in the growth of new colonies of mites.

The association of pyroglyphids with house dust allergy has been well documented. However, it is yet to be determined in what way mites are related to allergenic factors. There are three systems by which products from mites are thought to be deposited in house dust and in each of these systems the debris is readily mobile and tends to become airborne itself or as part of a dust fiber. These systems are—

(1) the integumentary system contributes shed cuticle, molting fluids and glands with their secretions;

(2) the reproductive system produces eggs, seminal fluid and probably accessory materials from egg laying and copulation; and

(3) the digestive excretory system contributes faecal material with a variety of components, and a gut lining very much like a peritrophic membrane.

Thus, it can be appreciated that control of this mite debris is achieved in the present invention by the application of pressurized emulsion compositions which produce a quick drying coating that substantially wets the mite and its debris, and adheres the mite and its debris to the fabric. Further, the coating of the invention must be flexible in order to maintain its continuity and entrapment of the debris when the fabric is flexed.

The net effect of treating fabrics infested with mites and debris with the pressurized coating compositions of the invention is the reduction of live mites in the fabric. Secondarily, these coated fabrics are substantially impenetrable towards mites which may attempt to reinfest the fabric and, thus, the fabric surface is no longer a microenvironment ideally supportive of mite activity; and the mites will tend to seek other host environments, thereby reducing the allergy potential of the treated fabric.

MAINTAINING REDUCED MOISTURE ENVIRONMENT

The population growth of pyroglyphids is closely related to the absolute humidity of the indoor and outdoor air; almost every change in humidity is followed by a change in mite numbers and mite activity.

It has been established that standardized female North American house dust mites maintain a constant equilibrium water mass, independent of ambient water vapor activities above the critical equilibrium activity (CEA = .70 at 25°C.). When confined to water vapor activities below the CEA, transpiration rate is greater than sorption rate and a net water loss is incurred for an increment of time.

Further, it has been established that the rate of water loss for mites held a dehydrated conditions is inversely proportional to the water vapor activity of the air. For example, for test water vapor activities of .525, .225 and .00, the rate of water loss is, respectively, 1.11, 1.40 and 1.77% hr^{-1} at 25°C. Mean survival time at these dehydrating activities is 69, 55 and 43 hours, respectively. Standardized females are 81 percent water by weight and tolerate water loss up to 46.5 percent before death occurs.

Thus, it can be appreciated that coating fabrics having high mite density with the pressurized compositions of the present invention can effectively control the mite microenvironment and reduce mite populations. This control is attributed at least in part to the hydrophobic nature of the continuous, flexible films applied to the fabric. These coatings product films that upon air drying have low water tension. These films tend to retain a moisture level less than required for mite subsistence, i.e. a CEA of less than 0.7 at 25°C. This results in an environment that is antagonistic to mite activity.

ISOLATE MITES FROM CRITICAL NUTRIENTS

House dust mites prefer nutrients such as human skin scales, dandruff, dry hair, vegetable fibers including lint, yeast and gelatin. Coating fabrics where mites tend to collect with the pressurized coating compositions of the invention have been observed to restrict the availability of such nutrients to the mites. Moreover, since the coating composition itself is not a nutrient for the mite, the continuous coating compositions tend to control the activity of those mites not immobilized by starving them.

APPLICATION OF THE COATING

It has been established that arthropods such as pyroglyphid mites have a peak growth activity which occurs annually depending on the climate. For example, in temperate moist climates the peak growth period for these mites extends from July to October. In addition, it has been observed that there is a high correlation between maximum indoor moisture level and living mites present during peak growth periods.

It has been found that if certain optimum mite host fabrics found in households are treated with the compositions of the present invention prior to such peak growth periods, mite populations and debris populations will be substantially reduced and the allergy potential of these fabrics is correspondingly reduced. Thus, certain critical fabrics found in a household are selectively treated prior to and during the peak growth period to control mite activity and to avoid reinfestation of mites, thereby reducing the allergy potential of the treated fabric.

There are certain areas of the typical household that are more supportive of mite activity than others. These include mattresses, bedding, upholstered furniture and carpeting.

The dense mite population common to mattresses is attributed in part to the excessive amount of human scale and plant fibers present which are known preferred nutrients for mites. In addition, the mattress is considered to provide the optimum constant moisture level available in most households. Mites are found to live in the surface layer of the mattress.

It can be understood why mattresses are considered the reservoir of pyroglyphid mite activity in most households and the source for mite reinfestation throughout the household. A preferred area of treatment for the present invention is the entire mattress surface and bedding. Preferably this treatment occurs periodically throughout the year.

COATING COMPOSITION

The present invention teaches controlling allergens by periodically coating various host fabrics with a stable emulsion comprising water, a high flash hydrophobic hydrocarbon control agent, an emulsifier, and a propellant. Said stable emulsion is packaged in an aerosol-type container having a valve and an actuator.

For the purpose of the present invention a stable emulsion is defined as a water-in-oil or oil-in-water emulsion wherein the dispersed phase remains substantially colloidally dispersed and does not separate to form a separate continuous liquids phase. This emulsion is considered stable if such separation does not occur within 71 hours of emulsification.

It is critical for the purposes of the present invention that the coating be applied to the substrate in the form of a stable emulsion in order to effectively treat the allergens present in various substrates with a film of the hydrophobic control agent. For example, when the hydrophic control agent is applied as such without emulsifying, it has sometimes been difficult to wet the allergens effectively. Another problem encountered periodically is that the host substrate is not coated completely and, thus, "hot spots" of pyroglyphid mite activity are found to exist after treatment.

The concentration of hydrophobic control agent ranges from between about 1 to about 5 percent by weight of the substrate when the substrate is a fabric. Generally, it has been observed with respect to fabrics that below about 0.5 percent hydrophobic control agent the treatment is ineffective, whereas loadings above 5 percent do not usually increase control.

HYDROPHOBIC CONTROL AGENT

Hydrophobic control agents suitable for the present invention are organic liquids comprised exclusively of carbon and hydrogen and which have a flash point from between about 202 to 260°C. These liquid hydrophobic control agents can have a broad viscosity range and include—

(a) liquids such as white mineral oils and paraffin oils which are polycyclic high boiling fractions having flash points between about 232 and 260°C that have been decolored, and natural oils such as castor oil, peanut oil, linseed oil and mixtures thereof;

(b) blends of liquids such as described above with semi-solids such as petrolatum, lanolin, glycols and mixtures thereof;

(c) blends of liquids and solids such as paraffinic and isoparaffinic waxes and mixtures thereof; and

(d) mixtures of (a) to (c) described above.

The importance of the viscosity of the control agent in controlling mite and debris mobility, moisture levels and availability of nutrients in the present invention can be readily appreciated.

These stable emulsion coating compositions are applied to the entire fabric surface and preferentially wet out, bond, and/or react with the mites and their debris such that when the water evaporates, a substantially continuous coating is obtained that restricts mobility of mites and their debris and alters the mite microenvironment as to nutrients and the availability of water.

EMULSIFIERS

As noted above, it is critical for the purposes of the present invention that the coatings be applied to the substrate in the form of a low surface tension fluid in order to thoroughly wet the fabric with the film-forming solution. In order to achieve the desired surface tension, it has been found necessary to

include small quantities of emulsifiers in the coating composition. These emulsifiers can be either anionic or nonionic. Useful emulsifiers include fluorocarbon surfactants, the salts of aliphatic sulfates, alkyl aryl polyethylene oxides and other commonly used anionic emulsifier agents.

These emulsifiers are used to disperse the hydrophobic control agent in water to form a stable oil-in-water emulsion (o/w) or to dispers water in the hydrophobic control agent to form water-in-oil emulsions (w/o). The nature of these emulsions is that they are stable and upon application to a substrate allow the hydrophobic control agent to form a substantially continuous coating on the mites. The concentration and type of emulsifier used is determined by the type of emulsion desired and/or the concentration of the hydrophobic control agent present.

THE PROPELLANT

It is critical for the purposes of the present invention that the film-forming solution be applied to the fabric in a controlled manner and that the dispensed solution be substantially dry to the touch within a reasonable period after application. It has been found that the solution need not penetrate deeply into certain fabrics like upholstery, bedding, etc., to be effective in the control of mites. In fact, overwetting of the fabric can have detrimental effects, such as prolonged drying time, which reduces the immobilizing potential for the mites. Additionally, alteration of the hand of the treated fabric can also result from overwetting. To this end it has been found that the means of application is closely connected with the overall efficacy of the present invention. And the present invention teaches the control of the application of the film-forming solution by means of a self-pressurized aerosol propellant.

The preferred propellants are liquefied normally gaseous hydrocarbons, liquefied halogenated hydrocarbons, and inert compressible gases. Preferred hydrocarbon propellants include the saturated aliphatic hydrocarbons such as propane, butane, isobutane, n-pentane, and isopentane. Preferred halogenated hydrocarbons include dichlorodifluoroethane, dichlorotetrafluoroethane, trichlorotrifluoroethane, and difluoromethane. Preferred inert compressible gases for use as propellants include nitrous oxide, nitrogen, and carbon dioxide. Mixtures of two or more propellants can be used. Other usable propellants include the normal and branched hexanes and heptanes.

The propellant is desirably utilized in an amount sufficient to expel the entire contents of the container. In general, the propellant will be from about 5 percent to about 50 percent, preferably about 5 percent to about 20 percent, by weight, of the total composition. The compositions will generally be expelled from the container as foam or a wet surface spray. The pressure in the container will generally be from between about 5 and about 75 psig., ie., 0.33 to 5 bars above atmospheric.

EXAMPLES I—IV

The following examples are given to illustrate embodiments of the invention as it is presently preferred to practice it. It wil be understood that these examples are illustrative and the invention is not to be considered restricted thereto except as indicated in the appended claims.

Various pressurized coating compositions are described for application to various fabric substrates. These pressurized coatings produce quickly drying films which are hydrophobic. It will be apparent from the following examples that various pressurized coatings can be applied to a variety of fabrics in order to control mite activity and thereby reduce the allergy potential of the fabric. It can be appreciated from these examples that a system of mite control could be developed for a typical household. Such a system would require periodic treatment of certain fabric surfaces and less frequent treatment of others.

It is expected that if these treatments were maintained consistently on all critical fabrics in a household, mite activity and thereby allergy potential in a household could be reduced substantially.

The examples are prepared using techniques common to emulsion technology. Applications of these "aerosol sprays" to fabric substrates are described in grams per square foot, ie. per 929 square centimetres.

Ingredients	Example I	Example II	Example III	Example IV
Hydrophobic control agent	50% mineral oil	20% mineral oil	35% vegetable oil	10% vegetable oil
Emulsifier*	2.5% Span 80	3% Triton X45	2.5% Span 20	3% Pluronic P105
Propellant	12.5% Isobutane 2.5% Propane	10% Isobutane	12.5% Isobutane 2.5% Propane	20% Isobutane
Water	32.5%	67%	47.5%	67%
Application In gm/sq ft of Fabric				
Mattress	2	–	–	4
Carpet	–	6	8	–
Upholstery	0.5	–	2	–
Blankets	–	2	–	3
Pillows	1	–	–	3
Sheets	–	1	2	–

*Span 80: Sorbitan mono oleate
Triton X45: Octylphenoxypolyethoxy ethanol
Span 20: Sorbitan monolaurate
Pluronic P105: Condensate of ethylene oxide with hydrophobic base formed by condensing propylene oxide with propylene glycol.

CLAIMS

1. An article of manufacture suitable for controlling allergens in fabrics comprising a pressurized container containing therein—

(1) a propellant,

(2) a hydrophobic organic solvent having a flash point between 177 and 260°C.,

(3) water, and

(4) an emulsifier.

2. The article of manufacture of claim 1 wherein said solvent and water constitute a water-in-oil emulsion.

3. The article of manufacture of claim 2 wherein said water-in-oil emulsion has a dry time of less than 30 minutes.

4. The article of manufacture of claim 1 wherein said solvent and water constitute an oil-in-water emulsion.

5. The article of manufacture of claim 4 wherein said oil-in-water emulsion has a dry time of less than 30 minutes.

6. A method of controlling allergens in fabrics comprising spraying said fabric with from between about 1 and about 5% by weight of the fabric with a pressurized aqueous coating composition that is substantive to said allergens, said composition comprising an emulsion containing—

(1) an aerosol propellant,

(2) a hydrophobic organic solvent having a flash point from between about 177 and 260°C.,

(3) water, and

(4) an emulsifier.

7. The method of claim 6 wherein said emulsion is a water-in-oil emulsion.

8. The method of claim 7 wherein said water-in-oil emulsion has a dry time of less than 30 minutes.

9. The method of claim 6 wherein said emulsion is an oil-in-water emulsion.

10. The method of claim 9 wherein said oil-in-water emulsion has a dry time of less than 30 minutes.

11. A method of controlling the biological and physical activity of pyroglyphid mites, including restricting the mobility of said mites and restricting the availability of critical nutrients to said mites while maintaining a reduced moisture environment around said mites comprising spraying fabrics containing said mites with a pressurized aqueous spray and depositing onto said fabric from between about 1 and about 5% by weight of an emulsion containing a hydrophobic organic solvent having a flash point between about 167 and 260°C. F. that is substantive to said mites.

12. The method of claim 11 wherein said emulsion is a water-in-oil emulsion.

13. The method of claim 12 wherein said water-in-oil emulsion has a dry time of less than 30 minutes.

14. The method of claim 11 wherein said emulsion is an oil-in-water emulsion.

15. The method of claim 14 wherein said oil-in-water emulsion has a dry time of less than 30 minutes.

16. An article of manufacture suitable for the controlling of allergens in fabrics, substantially as hereinbefore described and illustrated by the foregoing Examples.

17. A pigment-free composition which comprises a hydrophobic organic solvent having a flash point between 177 and 260°C, water and an emulsifier for packaging with a propellant in a pressurized dispensing container.

18. A method of controlling allergens in fabrics, substantially as hereinbefore described and illustrated by the foregoing Examples.

19. A method of producing an article according to Claim 1, substantially as hereinbefore described and illustrated by the foregoing Examples.

Printed for Her Majesty's Stationery Office by the Courier Press, Leamington Spa, 1981. Published by the Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.